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Determining Literacy Requirements of Jobs: Progress and Prospects for Project REALISTIC

by

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Prefatory Note

This paper was presented at a briefing for the Department of Defense, Manpower Research Planning Group (MRPG) on Project 100,000 activities, Washington, October 1969.

The paper summarizes progress on Work Unit REALISTIC, dealing with the determination of literacy requirements of selected military occupational specialties. This research is being performed by members of the Human Resources Research Organization, Division No. 3, Presidio of Monterey, California. Dr. Sticht presented the paper.

DETERMINING LITERACY REQUIREMENTS OF JOBS:
PROGRESS AND PROSPECTS FOR PROJECT REALISTIC

Thomas G. Sticht, Richard P. Kern,
John S. Caylor, and Lynn C. Fox

Work Unit REALISTIC was initiated by the Human Resources Research Organization in April 1968 at the request of the Office of the Assistant Secretary of Defense (Manpower) and the Deputy Chief of Staff for Personnel, Department of the Army. The requests were made because of awareness of the low reading skills that characterize men being admitted into the military services, the Army in particular, under Project 100,000. There was concern that a number of the "new standards" men might be assigned to jobs wherein the demands for reading skills might far exceed their ability and hence lead to job failure. To aid in decision making for dealing with this possibility, information was needed concerning the literacy demands of various Military Occupational Specialties (MOSs).

The general objectives of Work Unit REALISTIC are to provide (1) information on the literacy requirements of jobs in several major MOSs, and (2) information and suggestions for reducing discrepancies between personnel literacy skill levels and the literacy skill levels required by the job.

In pursuing these objectives, one of our first problems was to define "literacy" skill. Obviously, this refers to reading ability, but what is not so obvious is the definition of "reading ability." Most experts in the field recognize that reading is a complex of skills and abilities. It is also generally recognized that reading involves the ability to translate printed symbols into speech or auditory symbols, and that, in the early stages of reading training, most readers silently "speak" the words on the printed page to themselves. With advancement in reading skill, there appears to be less need to sub-vocalize the words, resulting in a more direct decoding of printed symbols into meaning.

Of particular concern to us was the fact that listening ability typically precedes reading ability, and, in fact, the reading process is usually built on a structure of listening ability. Because of this, we conjectured that some of the low aptitude men in Project 100,000 might not be able to learn a job well by reading, but would be able to learn by listening or "show-and-tell." Their primary literacy defect might be one of lack of skill in decoding printed symbolism. Thus, we decided to include listening as a component of literacy. At the request of the sponsors, we have also considered arithmetic ability as a component of literacy skill.

Having decided on the skill components to be included under the rubric of "literacy," the next step was to determine how to find out

what the requirements for these skills are in different Army MOSs. To accomplish this, we formulated two approaches used in sub-units, REALISTIC I and REALISTIC II.

The approach taken in REALISTIC I to study the literacy requirements of various Army job duties consists of comparing the literacy skills of men in selected MOSs to their performance on job proficiency tests. By the means shown in Figure 1, we hope to find out to what extent literacy is related to job proficiency.

REALISTIC I—Research Approach

LITERACY SKILLS	(are related to)	JOB PROFICIENCY (in)	SAMPLE MOSs
Reading		Job Sample	Armor 11E
Listening		Job Knowledge	Mechanic 63C
Arithmetic		Supervisor Ratings	Supply 76Y
			Cook 94B

CONTROLS: Armed Forces Qualifications Test Scores
and Time-On-The-Job

Figure 1

The literacy tests being used measure reading, listening, and arithmetic skills. The reading and arithmetic tests were selected from several commercially available standardized tests. The listening test was constructed under REALISTIC. It consists of three brief selections about military activities presented on a tape recording. Questions are asked, orally, after each selection, and the men write their responses on answer sheets. The test requires about 20 to 30 minutes to administer, and is rapidly scored by hand.

The job proficiency tests consist of job sample tests, which are "hands-on" performance tests, paper-and-pencil job knowledge tests, and supervisor ratings. These tests were constructed and administered in HumRRO Work Unit UTILITY. Literacy and job performance data were obtained for men in five combat and combat-support MOSs into which many of the men of lower literacy skill levels are assigned. The MOSs surveyed include the Armor Crewman (11E), Mechanic (63C), Supply Clerk (76Y), Cook (94B), and Medical Corpsman (91A). The Medical Corpsman's MOS will be omitted from this paper because initial data analyses have not yet been completed.

In Work Unit UTILITY,¹ job performance tests were constructed so as to include tasks representative—in terms of essentiality, frequency, and urgency—of tasks performed by men in the five MOSs. Therefore,

¹Robert Vineberg, "Progress Report on Work Unit UTILITY," HumRRO Professional Paper 6-70, March 1970.

an examination of the relationships between literacy test performance and performance on the job sample tests indicates the extent to which different levels of reading, listening, and arithmetic skills may have promoted, in a general manner, better job performance.

At the present time, all data collection is complete and data analysis is under way. In this paper, some reading, listening, and job performance data from our first level of analysis will be presented. These are data for which many sub-analyses will be made in the future, including analyses of the subtests of the job performance test batteries in the various MOSs.

A summary of some of the data obtained with Non-Mental Category IV¹ personnel, Figure 2 shows the relationships between reading and listening ability on the horizontal axis. Percent correct on the job performance

Scores of Non-Mental Category IV Personnel

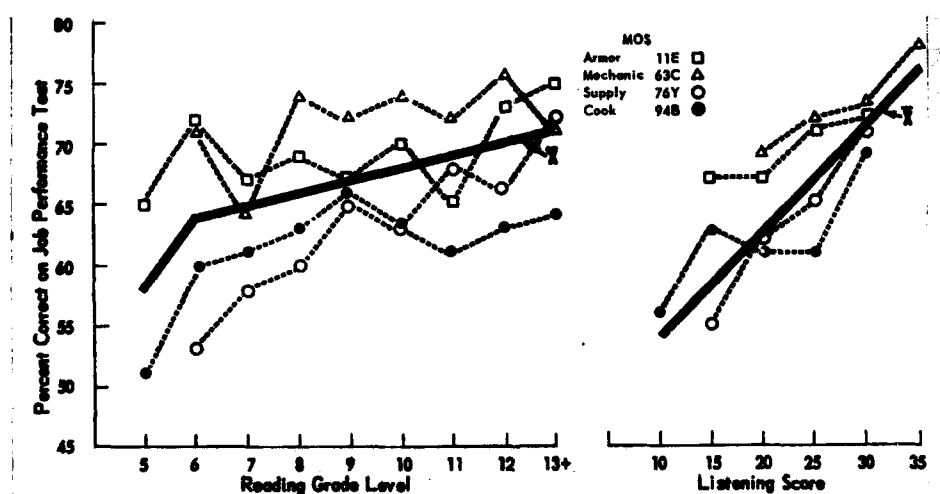


Figure 2

tests for four MOSs are shown on the vertical axis. As might be expected, there is considerable variability among the MOSs, particularly with regard to reading and job performance. It also appears, however, that for both reading and listening, the Armor Crewmen and Mechanics (the top two curves) tend to group together, and the Cook and Supply MOSs (bottom two curves) tend to group together, suggesting that the mechanically oriented MOSs may differ in their literacy skill requirements from the non-mechanical MOSs.

Another general feature to be noted is the change in job performance as reading and listening skill level increases. The general trend can be traced by the solid lines, labeled \bar{X} . These are straight lines

¹Armed Forces Qualification Test (AFQT) Group: Category I (93-99); Category II (65-92); Category III (31-64); Category IV (10-15).

fitted to the average job performance scores for the four MOSs combined. If we ignore the bend in the reading curve and note the change in job performance scores with reading scores increasing from fifth grade to 13 plus, the job performance increase amounts to about 14%. This contrasts with the 22% increase in average job performance that occurs over the range of listening scores from 10 to 35. These data support our original conjecture that listening skill may be equally or more important than reading skill for successful job performance. Additional support for this idea is provided in Figure 3.

Scores of Mental Category IV Personnel

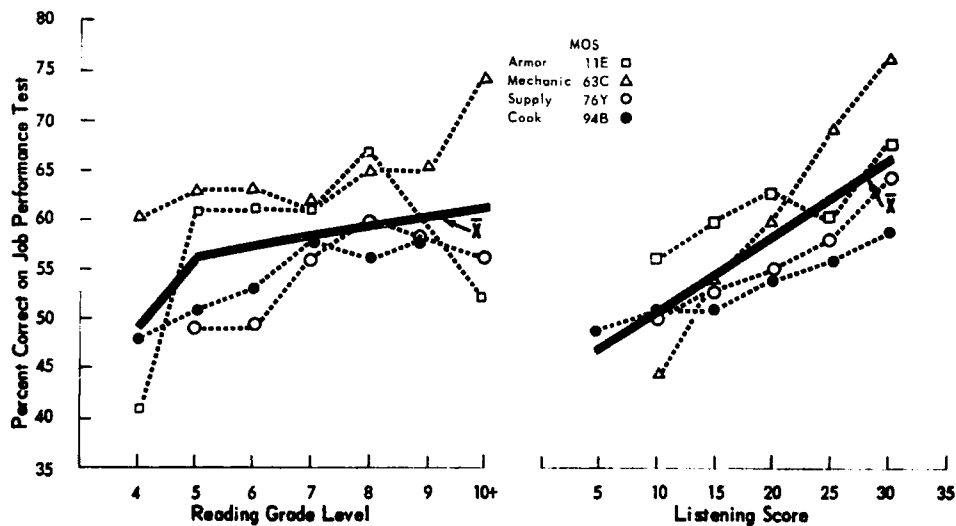


Figure 3

The same types of information are presented in Figures 2 and 3, but the latter deals with the lower aptitude, Mental Category IV men. Again there is a tendency for the Armor and Mechanic's data to form one group, and the Cook's and Supply data to form a second group. This is more evident for reading than listening. The bend in the reading curve occurs at grade 6 for the Non IVs, and grade 5 for the IVs, although further analyses are needed before we understand the significance of this bend in either mental category group.

It is again observed in Figure 3 that there is a fairly strong relationship between listening and job performance. This is even more interesting in the case of the Category IV personnel because they represent a fairly homogeneous aptitude group on AFQT, yet the listening test appears to be performing an additional sorting-out of personnel within this aptitude grouping into poorer and better job performance.

Analyses similar to these shown in Figures 2 and 3 are being performed with the arithmetic data, with job knowledge test scores, and with supervisor ratings as the indices of job proficiency. In the future, we have to analyze the job sample performance data with regard

to the number of prompts required by men of different literacy levels, the use of manuals by men of different literacy levels, and so forth. Let me say that from the combined results of our analyses of the REALISTIC I data, we hope to obtain extensive information bearing on the question of the literacy requirements for these MOSs.

However, REALISTIC I provides only partial information concerning the literacy requirements for the representative MOS because literacy tasks per se were not included in the job performance test battery developed by Work Unit UTILITY, from which REALISTIC I job proficiency data were obtained. In fact, literacy tasks per se have not been clearly identified in previous job or task analyses for any MOS. For this reason, we formulated our second approach to the evaluation of literacy requirements of major MOSs - Sub-Unit REALISTIC II.

The first general objective of REALISTIC II is to identify reading, listening, and arithmetic tasks in a set of MOSs representative of mechanical, clerical, and service occupations. For this purpose, we have selected three of the same MOSs examined in REALISTIC I, Mechanic (MOS 63C), Supply (MOS 76Y), and Cook (MOS 94B). These MOSs offered the possibility of extending some of the UTILITY and REALISTIC I data to REALISTIC II. At Fort Ord and Fort Carson we obtained information from some of the same men tested in UTILITY and REALISTIC I.

Our second objective in REALISTIC II is to identify reading skill levels sufficient for effective performance of job-related reading tasks. The third objective is to suggest methods for modifying reading tasks to reduce the need for literacy skill in certain jobs. This will include recommendations for the redesign of reading materials, and the substitution of listening for reading tasks where this will facilitate job or training performance.

To identify job-related reading tasks, we developed a structured interview that was administered to men in the target MOSs at their job locations. Men were selected for interview on the basis of AFQT, time-on-the-job, and reading grade level of ability as determined by pretests. An effort was made to include as many men as possible who had been tested in UTILITY and REALISTIC I research.

The information obtained with the structured interview included personal data, and a description of a "typical" work day, in which a man attempted to describe various activities he might perform. There were also three questions designed to obtain information about the listening, reading, and arithmetic tasks that a man might perform on the job. For listening tasks, the man was asked to give five instances when he had asked somebody for job-related information in the last month or so. Questioning was continued until the man said he could think of no other such instances.

A similar procedure was used for identifying reading tasks. The man was asked to give examples of when he had been doing some job activity and had used printed materials—a manual, a form, a letter, and so forth. Usually this brought a report of the use of some manual. The man was then asked to get the manual and locate the exact page he had used. This came as a surprise to many of them, and we observed

informally many instances where a man took 15 to 20 minutes to locate a page, and sometimes failed to locate it at all. This failure appeared to result, at times, from the difficult indexing system of some of the manuals, and at other times, we found that the man had not actually used the manual before, having depended on one of his buddies to locate the section he needed. After obtaining as many citations of printed materials as possible, up to a maximum of five—which most men were unable to report—we asked for five examples of the use of arithmetic. We found very little use of arithmetic.

We also solicited ways to modify materials to make them easier to use, but most men reported them to be satisfactory, even though they often couldn't use the materials they brought to us.

From the interviews we obtained a great deal of information to help identify literacy tasks in these MOSs. One line of analysis that we have accomplished is shown in Figure 4. The figure shows the average reading grade level of difficulty of publications in five MOSs as estimated by the Flesch readability formula. The figure also shows the reading abilities of men in these MOSs, differentiating for Non-Category IV for Category IV men. For our purposes, the bars of interest are those concerning the Supply, Mechanic, and Cook MOSs. There are large discrepancies between the readability of the manuals and the

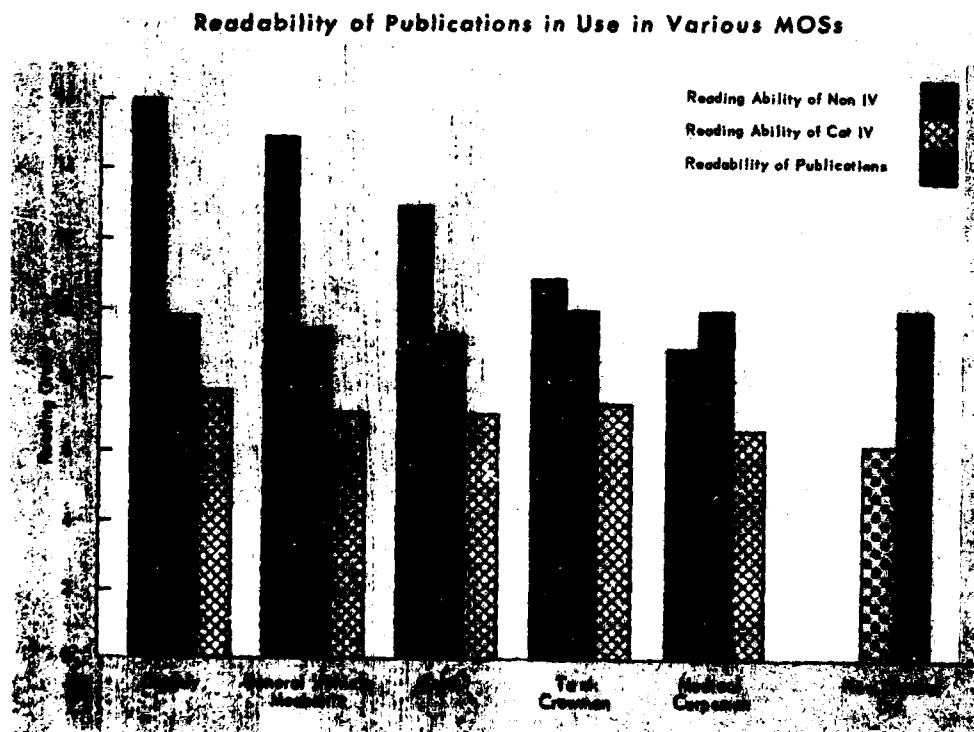


Figure 4

reading abilities of the men in the MOSs. This discrepancy is less for Cooks, because their materials are less difficult. One of the questions of concern is whether the differences between readability (i.e., ease of understanding the materials) and reading ability levels, make any real difference on how much people in the MOS will use the manuals.

In Figure 5 data relevant to this question are presented. On the left, we have replotted the readability figures for publications in the three MOSs—76Y, Supply; 63C, Mechanics; and 94B, Cooks. On the right we have plotted data obtained with our interview. These are "readership"

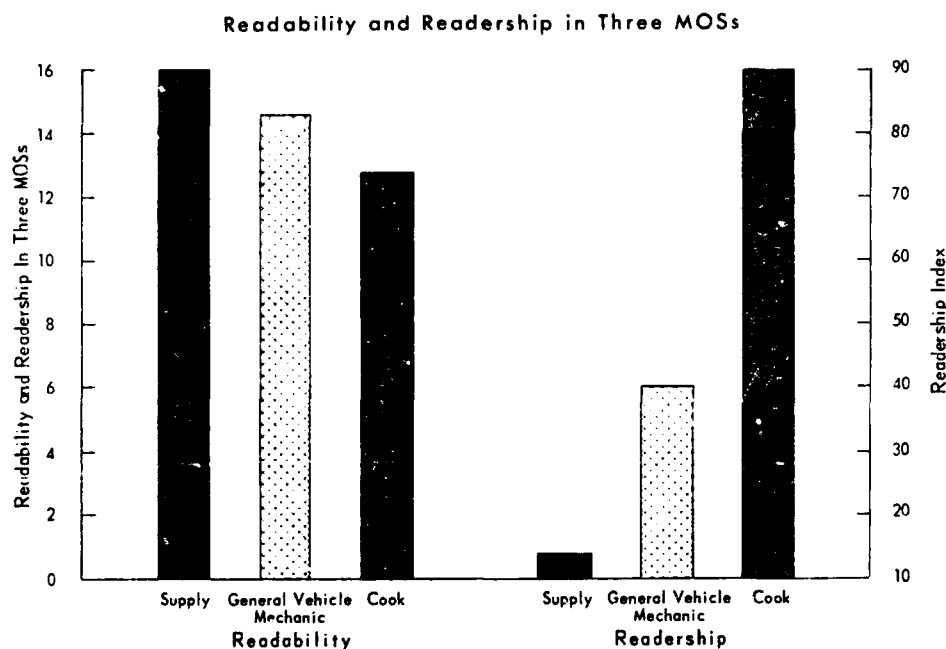


Figure 5

data, referring to the extent to which men in the MOS reported the use of printed materials—the higher the bar, the greater the extent of use. Of interest is the fact that the readership is low in the Supply MOS, where reading difficulty of materials is high, and the readership increases in those MOSs where the readability of the reading materials improves. Thus, as the reading difficulty decreases, the readership increases.

Figure 6 shows the same data as Figure 5, but in this case, the readability of materials is plotted on the horizontal axis, and the readership on the vertical axis. In addition, there are data for men of three reading ability levels, who scored at grades 4 to 6.9, 7 to 8.9, or 9th grade or beyond, on our reading tests. It is shown that the Cooks (94B), who have the easiest materials, also show the greatest

Readability, Readership, and Reading Grade Levels

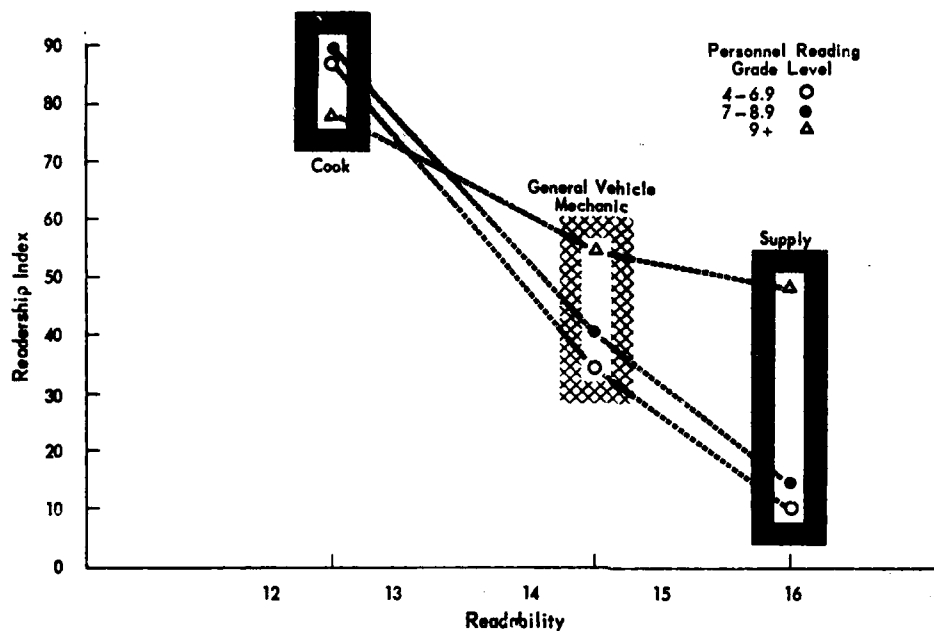


Figure 6

use of publications. The Mechanic MOS materials are more difficult, and the readership index in this MOS declines. The Supply MOS publications are the most difficult, and they have the lowest readership index. The readership score for the higher reading ability groups does not decrease as much as that for the lower ability readers, suggesting that the more difficult the reading materials are, the more the poor readers tend to avoid them. In fact, they may tend to rely more on listening sources than reading sources for job information, as is suggested in Figure 7.

We have plotted an information modality index in Figure 7. This provides an indication of the extent to which men in an MOS tend to rely more on listening than on reading for getting job-related information. In Figure 7, scores below 100 mean that the different reading ability groups tended to rely more on listening for job information, and scores above 100 mean that reading materials were used more than listening sources for obtaining job-related information.

The poorer readers in the Supply and Mechanic MOSs tend to rely more on listening than reading, as is shown, whereas in the Cook MOS this is not true. As we have stated, the Supply MOS has the most difficult printed materials, the Mechanic the next most difficult, and the Cook the least difficult material. Hence, the tendency to use listening sources is related to both reading ability of the men and reading difficulty of publications in these MOSs.

While the import of these data will not be clearly evident until further analysis of the MOS printed materials, early data in Work Unit

Comparison of Reliance on Listening and Reading

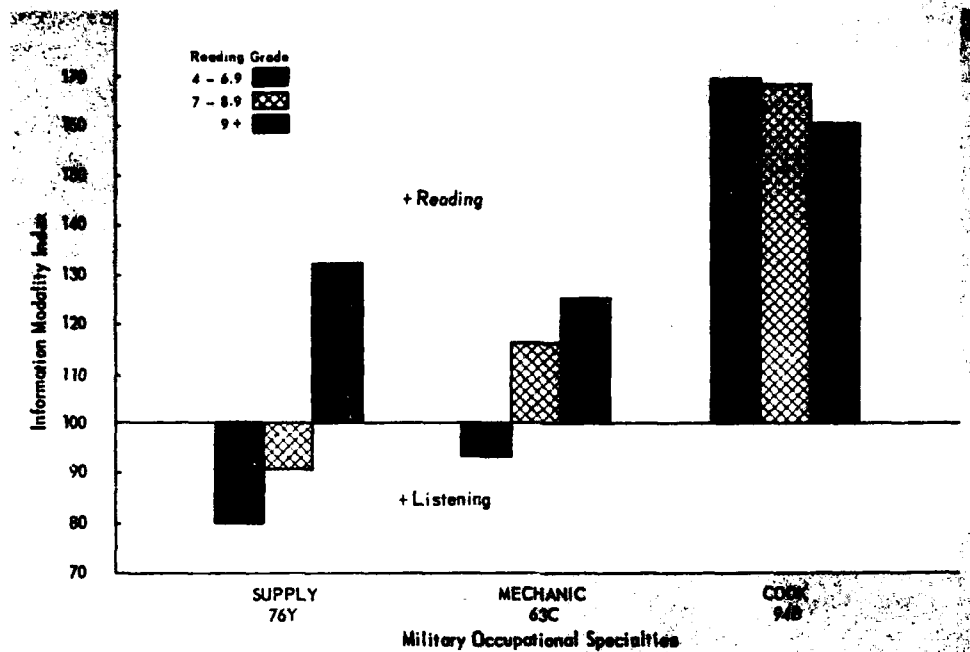


Figure 7

UTILITY have indicated that mechanics who used manuals in performing their job sample tests tended to do better than men who did not use the manuals. This was true for both Category IV and Non-Category IV men. Thus, if there is a desire to have men use more printed materials on the job, perhaps to ensure better performance, then the present data on readability, reading ability, and readership across the three MOSs suggest that this might be accomplished both by improving literacy skills of the men, and by the redesign of reading materials. Furthermore, the present data suggest that greater gains in readership are to be expected from redesigning materials than from increasing the literacy skills of men. Obviously, there are implications for selection, classification, and training in the data.

At the present time we are obtaining copies of all printed materials used in the on-the-job interviews and classifying them into six content categories referring to the type of information presented: Standards and Specifications, Identification and Physical Description, Procedural Directions, Functional Descriptions, Procedural Check Points, and Theory. "Standards and Specifications" include such things as gap and point settings, and type of form. The category "Procedural Directions" might give procedures for assembling a piece of equipment, removing a part, baking a cake, and so forth. We are also classifying, according to these same content types, the kind of information the men said they were trying to find in the printed materials. We have found, for instance, that a man was seeking Standards and Specifications in

material that offers Procedural Directions—or he may have been using material that presents Standards and Specifications to obtain an identification of a part. We are attempting to use the various classification systems to define reading tasks in terms of the type of information a man seeks from a given content type of reading material.

We are also classifying the different content type materials according to their format; for example, whether the material is in tabular or narrative format. Obviously, the reading task of seeking Standards and Specifications in a Procedural Directions type of content, presented in narrative format, is a much different reading task than seeking standards and specifications in a Standards and Specifications type of content, presented in tabular format.

As soon as the identification of reading tasks has been completed, we intend to construct reading task performance tests, and determine how well men of different reading ability levels can perform the different reading tasks. Among other things, this information will indicate the reading skills needed to successfully perform job-related reading tasks.

Research under REALISTIC has also involved a series of experimental studies exploring reading and listening skills for men of different aptitude levels (REALISTIC III). Emphasis has been on the experimental evaluation of the use of time-compressed speech as an audio job or training performance aid. Some of the major conclusions in a technical report completed under REALISTIC III, are that, where feasible, reading *and* listening materials should be available to students, so that those who learn better with one modality than the other may exercise that skill. Also, listening materials can be subjected to acceleration in speech rate to produce rates around 250 to 275 words per minute without seriously impairing comprehension. This is true for both high and low aptitude men, and thus permits listening rates comparable to average silent reading rates.

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13. ABSTRACT Project REALISTIC is concerned with identifying <u>RE</u> ading, <u>LI</u> stening, and <u>AR</u> ithme <u>TIC</u> skills adequate for performing successfully in several military occupational specialties. This paper reports progress on this research and projects future activities. Summarized are data on the relationships of reading and listening test scores to job performance, the reading difficulty levels of job-related printed materials, and the extent of usage of reading and listening information sources by men of low, medium, and high reading ability.		

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